

**Thought Technology Ltd.**

2180 Belgrave Ave. Montreal, Quebec,  
Canada H4A 2LB

Tel: (514) 489-8251  
Fax: (514) 489-8255

E-Mail: [mail@thoughttechnology.com](mailto:mail@thoughttechnology.com)

Come visit us on the Internet  
<http://www.thoughttechnology.com>

---



0413

The Manufacturer:

Thought Technology Ltd.  
2180 Belgrave Avenue  
Montreal, Quebec, Canada  
H4A 2L8

System Name:

MyoTrac™ EMG Biofeedback System

System #:

T4000P/T4001P

Device Name:

MyoTrac™ Biofeedback Unit

Device #:

SA4000P/SA4001P



- Type BF Equipment
- Internally powered equipment
- Continuous operation
- Read Instruction



#### CAUTION

- US Federal Law restricts this device to sale by or on order of licensed health care practitioners.

#### WARNING

- Do not operate MyoScan sensor within 10 feet of an operating cellular phone, similar radio transmitting device, other powerful radio interference producing sources such as arc welders, radio thermal treatment equipment, x-ray machines or any other equipment that produces electrical sparks etc.
- Do not connect inputs or outputs of the encoder or sensors to line powered devices.
- All MyoTrac units are totally isolated from line (110 or 220VAC) power due to battery operation. However, many hospitals and the FDA require that computers, printers and any other equipment used with medical devices be electrically isolated from line voltage to UL or CSA medical safety standards.
- After use, the Disposable Electrodes may be a potential biohazard. Handle, and when applicable, dispose of these materials in accordance with accepted medical practice and any applicable local, state and federal laws and regulations.

- Radiated radio frequency electromagnetic fields can cause performance degradation in the MyoScan sensor. In the worst case, a RF field strength of 22mV/M can cause a degradation of 1 $\mu$ V in the signal from the MyoScan sensor. Be sure to keep in mind that a very relaxed muscle should provide an EMG reading of approximately 1-3 $\mu$ V.
- Do not use in the presence of a flammable anesthetic mixture with air or with Oxygen or Nitrous Oxide.
- Not to be immersed in water.

#### **ATTENTION**

- To prevent static discharge from damaging the sensor and/or encoders, use anti-static mats or sprays in your working area. A humidifier may also be used to prevent static environments by conditioning hot, dry air.
- To prevent voiding warranty by breaking connector pins, carefully align white guiding dot on sensor plug with slot on sensor input.
- Do not apply any electrode gel or equivalent directly on the sensor snaps. Always use electrodes as a medium between the sensor and the client.
- Make sure to remove electrodes from sensor snaps immediately after use.
- Apply conductive gel only to electrodes; never put gel directly to sensor snaps.
- Do not plug third party sensors directly into instrument inputs. Plug only Thought Technology Active Sensor cable connectors into instrument inputs. All EMG electrodes and third party sensors must be connected to MyoScan sensors, either directly or through an adapter.

- Remove batteries when the device is not being used for extended period of time. Please dispose of battery following national regulations.
- Sensors damaged by static electricity are not covered under warranty! In dry climates, apply anti-static spray on carpets each week and/or use a conductive floor mat (available from computer stores).

## **CONTRAINDICATIONS**

- None

## **INTENDED PURPOSE**

- Biofeedback, Relaxation & Muscle Re-Education purposes.

## **NOTE**

- No preventative inspections required. Maintenance must be performed by qualified personnel.
- The supplier will make available, upon request, circuit diagrams, component parts lists and description or other information required for the repair of product by qualified personnel.

*Manual # SA9601 Rev.5*

**Table of Contents**

Introduction.....	6
Installing and Testing Your Battery .....	7
Trying Your MyoTrac for the First Time .....	9
Use of the MyoScan™ Sensor.....	9
Front Panel Controls .....	14
Battery Compartment Controls.....	15
Side Panel Jacks.....	18
Setting the Threshold Potentiometer.....	18
Connecting to a Voltage Monitoring Device .....	20
Care of Your Instrument .....	21
Specifications .....	22
Accessories .....	23
Warranty .....	24
Extended Warranty Program.....	25
Repair Return Form.....	27
Other Products and Services from Thought T.....	28

## **Introduction**

Biofeedback is a rapidly developing scientific field that has grown out of advances in physiology, psychology and electronics. Ordinarily, we are unaware of the subtle internal body activities that are part of our everyday lives.

Biofeedback uses sensitive electronics to detect and amplify these activities in order to bring them to awareness. By allowing us to observe these activities, biofeedback also allows us to learn to modify them. Since we are immediately aware of the outcome of our attempts, we can gradually learn to produce the results we desire.

Muscles go through a wide range of activity. Normally, we are only aware of the muscle activity associated with movement, such as occurs in swinging a tennis racket. Yet much muscle activity produces no visible movement and, as a result, goes unnoticed. EMG (electromyographic) activity is a measure of the electrical activity in the muscles. Since the electrical activity of the muscle increases when the muscle is tensed and decreases when it is relaxed, EMG biofeedback can provide information about the state of relaxation or tension of our muscles.

Our muscles respond to threatening, stressful situations with large increases in tension. This response is part of an old reflex left over from a time when one had to either fight or flee from a stressful situation in order to survive. Today, fighting or running isn't generally appropriate. So, in most stressful situations, there is increased muscle tension, which cannot be dissipated by fighting or fleeing. If this high tension continues, muscle fatigue, soreness, or even pain may result.

Work with EMG and relaxation and tension began during

the 1920's and 1930's through the pioneering efforts of Edmund Jacobson. Jacobson found that the more relaxed a muscle was, the lower its EMG activity level was. He also noted that this lowered EMG activity level was associated with a more general subjective sense of relaxation.

EMG biofeedback is also being applied very successfully in rehabilitation medicine - such as in regaining control of lost muscle function, re-establishing the correct relationship between agonist and antagonist muscles, relaxing spasmodic activity and in strengthening weak or atrophied muscles.

While Jacobson's work marked a milestone in EMG research, his methods of measuring EMG were crude and cumbersome by today's standards. The MyoTrac represents a tremendous step forward in EMG technology. Thanks to solid state electronics and micro circuitry, equipment which used to fill a laboratory in Jacobson's time can be replaced today by the MyoTrac - small enough to fit in the palm of your hand.

## **Installing and Testing Your Battery**

**Battery Insertion:** We strongly recommend the use of an alkaline or lithium 9 volt battery. You can use a rechargeable nickel-cadmium (NiCad) battery, but keep in mind that although NiCad batteries can be charged many times, they last only about one quarter as long in operation as an alkaline battery.

To insert or remove the battery, hold the device in one hand and firmly grasp the sides of the battery compartment lid with the other. Pull straight towards the rear of the case to slide it off (see Figure 1). Replace the battery, being careful to observe the proper polarity. Slide the lid back in place,

pushing gently to snap the clip.

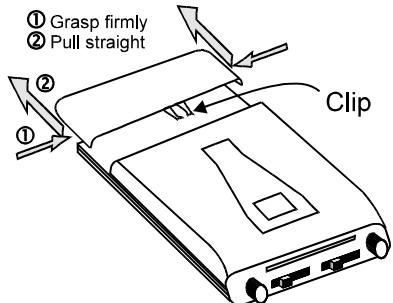
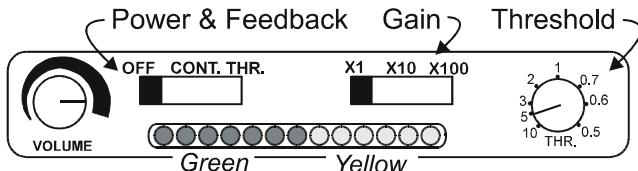


Fig. 1 Opening the battery compartment

*Note: Remove old batteries promptly to prevent corrosion. Remove the battery if the device is not going to be used for periods longer than one month.*

**Testing the Battery:** To check the battery, turn the unit on, place the threshold potentiometer to **5**, and the scale-reading switch to **x1**. With a Triode electrode snapped on the MyoScan sensor, place the sensor over a muscle and tense it. *If the first yellow LED in the middle of the bargraph does not light as the LEDs go from left to right, then change or recharge the battery.*



MyoTrac (SA4000P & SA4001P)

### **Trying Your MyoTrac for the First Time**

Plug the MyoScan sensor into the **INPUT** jack. Set the switches inside the battery compartment to: **OFF, OFF, ABV, NAR** (fig. 7). Set the gain switch to the **x1** position. Turn the volume up. Set the threshold potentiometer to **10**. (fig. 6). Snap a Triode electrode on the three MyoScan connectors (fig. 2). Hold the MyoScan sensor on your cheek with a light pressure, placing it just below the cheekbone (over the temporomandibular joint). Make certain that all three electrodes contact the skin. Observe the tone and bargraph reading as you tense and relax your jaw by clenching your teeth. *When the first yellow LED lights up, the actual EMG reading corresponds to the threshold value that is set on the **THR.** Dial, in this case,  $10\mu\text{V}$ .*

### **Use of the MyoScan™ Sensor**

The MyoScan sensor incorporates sensitive electronic circuitry to amplify the minute EMG signals *directly under the electrode connectors* so that the MyoTrac's readings will not be affected by cable movement or outside electrical interference. For the MyoScan sensor to function properly, electrodes must be inserted on the sensor head. There are several choices of electrodes which can be used, depending

on the muscle site to be monitored. The disposable Triode electrodes will be adequate for most applications.

**Disposable Triode Electrodes (#T3402M):** Disposable electrodes avoid cross contamination of patients. The foam-backed triangular Ag-AgCl (silver-silver chloride) Triode electrodes can be used for scanning most muscle sites for activity. Remove the back covering exposing the adhesive to firmly hold the MyoScan sensor in place (see figure 2). Generally, no skin surface preparation is required; however, for guaranteed stability over very dry or hairy areas, clean the target site with an alcohol wipe or apply a tiny dab of electrode gel to each electrode. Be careful to avoid applying the electrode gel to the skin between electrodes, which could attenuate the signals.

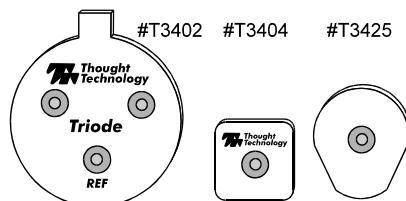


Fig. 2 Triode, single and Uni-Gel electrodes

For measuring EMG activity over specific muscle sites which are not suitably monitored by the triangular configuration, or where a wide placement is required, an extender cable can be used.

**Extender Cable (#T8720M):** Thought Technology's 450mm extender cable can be inserted directly into the sensor head (figure 3), being careful to align the alignment

dot on the cable connector with the groove on the sensor head.

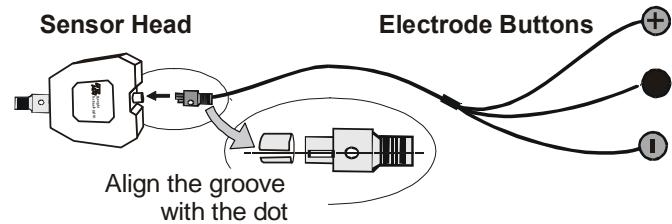


Fig. 3 Extender Cable

When an extender cable is used, Disposable Single Electrodes (#T3404) or Disposable Uni-Gel Electrodes (#T3425) are snapped in the three electrode buttons (see figure 2 & 3).

*Note: To remove the electrodes, hold the sensor or the extender cable button with one hand, place the index finger of the other hand on the electrode and slide the thumb nail between the electrode and the electrode snap, pry the electrode gently out of the snap.*

**Sensor placement:** Generally, the sensor is placed on a muscle site so the two active electrodes are positioned parallel to the muscle fibers (i.e. placed in line with them). (See figure 4)

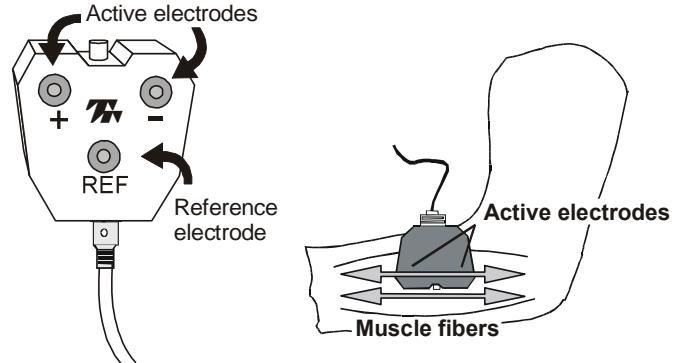


Fig. 4 Sensor Placement

#### **Sensor jacks and plugs:**

Plugs and jacks with protected pins: Thought Technology has developed its own patented gold plated protected pin system for all sensor and encoder plugs and jacks. The protected pins are designed to prevent any possibility of direct skin contact with the metallic elements that conduct the amplified signals. They also help prevent accidental damage from attempting to plug Thought Technology sensors and encoders to equipment for which they were not designed.



### **Replacement Sensor Cable (Model T9385M)**

Thought Technology sensors use a highly flexible and lightweight cable. If, for any reason, a break should occur in the cable, a replacement cable is available. To change cables, tightly grip the connector plugged into the sensor with your index finger and thumb and pull out the cable from the sensor. Replace the cable with a new one, being careful to align the plug with the appropriate holes in the sensor jack (plug will align only in one direction).



### **Model #SA9385M**

To change cables, tightly grip the connector plugged into the MyoScan with your thumb and index, and pull gently on the connector. Replace the cable with a new one. Be very careful to align the notch on the cable connector with the guiding groove on the sensor head, since the plug will align in only one direction (see figure 5).

## Guiding Notch and Groove

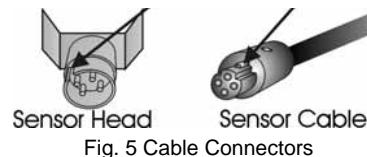
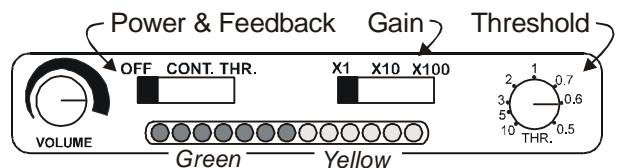


Fig. 5 Cable Connectors

## Front Panel Controls

The front panel (see figure 6) includes controls for sound level (**VOLUME**), threshold level (**THR**), three gain settings, **x1**, **x10** and **x100** for ranges of .08-20, .08-200 and .08-2000 microvolt ( $\mu$ V). R.M.S., respectively. Also, a power switch lets you select **OFF** and either continuous proportional tone feedback (**CONT**) or threshold feedback (**THR**). Threshold feedback allows you to set control parameters for the tone feedback to be enabled or disabled when the EMG signal exceeds or falls below the threshold setting of the threshold control. The various threshold functions are chosen from the switch settings in the battery compartment.



MyoTrac (SA4000P & SA4001P)

Fig. 6 Front Panel

*Note: Previous models of the MyoTrac EMG unit had only one yellow LED and five red ones on the right. In those units, the yellow LED corresponds to the set threshold value.*

## **Battery Compartment Controls**

Within the battery compartment are switches to set a variety of choices as follows: (see figure 7)

**WIDE/NAR** bandpass (20-500 Hz. or 100-200 Hz.): Sets the frequency range for signal detection. The 20-500 Hz. range detects a wider range of EMG signals, but is also prone to cardiac (EKG) interference. For this reason, it is not recommended for monitoring sites on the back or torso.

**ABV/BLW:** This switch determines if the tone feedback is turned on when the signal exceeds (ABV) or falls below (BLW) the threshold potentiometer setting.

**ALARM/OFF:** When either the 4 or 60 second switch is set, the threshold is exceeded for at least 4 or 60 seconds, a continuous (not proportional) tone will sound. This alarm will sound as long as the signal stays above threshold. As soon as the signal drops below the threshold, the tone turns off. If the threshold is exceeded again for 4 or 60 consecutive seconds, the warning signal will start once more.

*Note: Alarm does not work with the BLW setting.*

**LOCK/OFF:** Works only with alarm (ALARM) on. LOCK locks on a continuous high-pitched tone to alert the user that the threshold level has been exceeded (if set ABV),

for more than 4 or 60 seconds. Once the warning signal has been triggered on, it can only be canceled by moving the front panel power switch to the CONT or OFF positions.

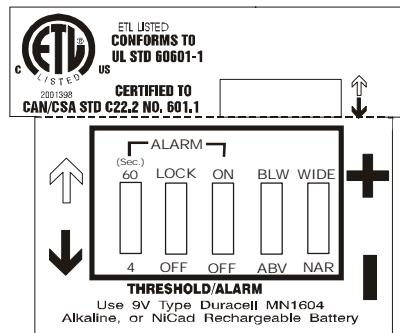


Fig. 7 Battery Compartment Controls

The three threshold switches, **LOCK/OFF**, **ALARM/OFF** and **BLW/ABV** are only functional when the front panel power switch is set to **THR**. Possible combinations are:

	LOCK/OFF	ALARM/OFF	ABV/BLW	
1	OFF	OFF	ABV	Proportional tone feedback above threshold.
2	OFF	OFF	BLW	Proportional tone feedback below threshold.
3	OFF	ALARM 4 or 60 sec.	ABV	Alerting tone when EMG above threshold for > 4 or 60 seconds. (goes off immediately when EMG goes below threshold).
4	OFF	ALARM	BLW	Not valid position. Alarm (ALARM) works only for above (ABV) threshold position.
5	LOCK	ALARM	ABV	Same as condition 3; however the tone locks on until the power switch (OFF/CONT/THR) is turned off.
6	LOCK	ALARM	BLW	Not a valid position.
7	LOCK	OFF	ABV	Not a valid position.
8	LOCK	OFF	BLW	Not a valid position.

## **Side Panel Jacks**

(see figure 8)

**INPUT:** Plug the MyoScan sensor in here.

**EAR:** Plugging the earphones in here disconnects the internal speaker and sends tone feedback through the earphones.

**0-2V:** Provides a 0-2 Volts output signal. The MyoTrac can be connected to other third party device with an isolated voltage input that accepts 0-2V. *Make certain the instrument complies with IEC 601-1.*

*Note: This output is the same for all the gain settings. An output value of 2 Volts will represent 20  $\mu$ V at the **x1** setting, 200  $\mu$ V at **x10** and 2000  $\mu$ V at **x100**.*

 **WARNING:** Never connect your MyoTrac to an A.C. powered device!

## **Setting the Threshold Potentiometer**

The threshold control's main function is to set a goal value for the EMG signal. When that value is reached, the tone is heard, which provides immediate feedback to reward or inhibit a particular behavior. This control can also be used to place the EMG signal at a desired point on the bargraph, moving it right or left by turning the knob. It is also possible to determine the exact EMG reading in micro Volts. As previously mentioned, when the signal is at the first yellow LED, EMG activity corresponds to the threshold setting. The left-most LED indicates 1/2 the threshold value and the right-most LED is 2 times the threshold value.

The Gain setting determines the reading range: 0-20  $\mu$ V at **x1**, 0-200  $\mu$ V at **x10** and 0-2000  $\mu$ V at **x100**. For each gain setting, the possible threshold values are: .5-10  $\mu$ V (x1), 5-100  $\mu$ V (x10), and 50-1000  $\mu$ V (x100) respectively.

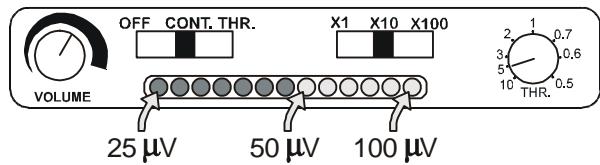
#### **Example of Threshold Setting:**

If you want to do a feedback session for the purpose of encouraging an increased level of activity in a specific muscle, initially set the gain to **x1**. If, with a normal contraction, the reading is near the left end of the green scale, then you might want to set the threshold control to a lower number (turn the knob clockwise); this will move the signal toward the right, making it easier to reach the threshold.

Conversely, if the reading is at the top of the scale (all the way to the right), you might want to increase the threshold (turn the knob counterclockwise) to move the signal to the left. If this is not sufficient, you can increase the range by switching the scale reading switch to the **x10** or **x100** position.

Let's say that the **THR** dial is set to **5** and the gain switch to **x10**. The first yellow LED would represent 50  $\mu$ V (5 x 10), the left most green LED would be 25  $\mu$ V and the right most yellow LED, 100  $\mu$ V.

MyoTrac (SA4000P & SA4001P)



## **Connecting to a Voltage Monitoring Device**

Connect the 0-2V output jack (see figure 8) to any instrument capable of reading from 0-2 Volts (digital voltmeter, analog voltmeter, polygraph, integrator, etc.). *Make certain the instrument is battery operated or complies with IEC 601-1.* The output voltage will always be in the 0-2 Volt range; however, the actual EMG level in microvolt RMS is dependent upon the Gain setting. Range values are obtained by multiplying the output voltage reading as follows:

Switch = x1, multiply by 10	Ex: Voltage = 0.9; EMG = 9 $\mu$ V
Switch = x10, multiply by 100	Ex: Voltage = 1.5; EMG = 150 $\mu$ V
Switch = x100, multiply by 1000	Ex: Voltage = 1.1; EMG = 1100 $\mu$ V

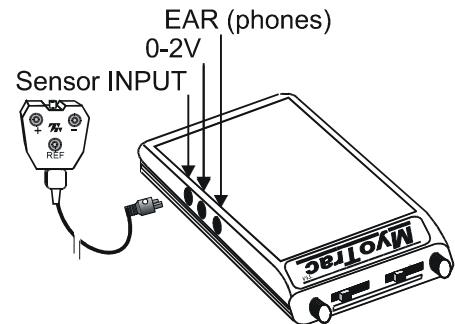


Fig. 8 Side Panel Jacks

## **Care of Your Instrument**

Basically, no maintenance, other than cleaning, is required. Any surfaces, which come in contact with skin, should be cleaned after each use by wiping with a damp cloth. If conductive gel is used, use precaution not to apply any gel on the sensor head. If gel gets inside the sensor's electrode connectors, clean immediately with a moistened Q-tip to remove the gel.

### **IMPORTANT POINTS TO REMEMBER:**

- ① Protect from static electricity:** The MyoTrac and MyoScan are sensitive electronic instruments, and should be handled as such. Damage can occur if used in dry, carpeted areas without a static mat or a static guard product sprayed on the carpets.
- ② Connect and disconnect with care:** When unplugging the sensor from the MyoTrac or the sensor cable from the sensor head, be careful to avoid pulling on the cable. Instead, grip the connector firmly and pull straight out. Always make sure to align the notch on the cable connectors (indicated by a dot) with the guiding groove. Never force a connector in the socket.
- ③ Always remove the electrodes:** Do not leave the electrodes connected to the sensor head when the device is not in use as this could cause corrosion damage to your equipment.
- ④ Remove batteries promptly:** The MyoTrac is battery operated. To prevent corrosion damage due to battery leak, remove battery when not in use for long periods of time and when battery is old.

## Specifications

### MyoTrac SA4000P/SA4001P Hardware Specifications

Size (approx.)	61mm x 112mm x 25mm (2.4" x 4.4" x 1")
Weight (approx.)	73g (2.5oz)
Input Impedance	1,000,000MΩ in parallel with 10pF
Signal Input Range x1	0 – 20µV
Signal Input Range x10	0 – 200µV
Signal Input Range x100	0 – 2000µV
CMRR 20 – 500 Hz (approx.)	130dB
CMRR @ 60 Hz (approx.)	180dB
Channel Bandwidth (Wide)	20Hz ±5Hz – 500Hz ±50Hz
Channel Bandwidth (Narrow)	100Hz ±10Hz – 200Hz ±20Hz
Signal Output Range	0V – 2V
Supply Voltage	7.4V – 9.6V
Current Consumption	10mA – 3mA /+5mA
Battery Life (Alkaline)	40 Hours minimum
Low Battery Warning	7.4V
Accuracy	±5% and ±0.3mV

## Accessories

- (T9385M) Cable, replacement Protected Pin (48in.)
- (T8720M) MyoScan Sensor Extender Cable (450mm).
- (T3402M) Disposable Adhesive Triode Electrodes. (100)
- (T3404) Disposable Single Electrodes. (300)
- (T3425) Disposable Uni-Gel Electrodes. (100)
- (SA3404) MyoTrac Accessory Kit: Includes 15 Triode Electrodes, 30 Single Electrodes, 1 sensor Extender Cable and 1 EMG Headband.

### **To Order in U.S.A.:**

**Call 1-800 361-3651** (sales only)

or call

**(514) 489-8251** (sales and technical support)

**Fax:(514) 489-8255**

**E-Mail: [mail@thoughttechnology.com](mailto:mail@thoughttechnology.com)**

## **Warranty**

MyoTrac and MyoScan and all equipment including optional items are guaranteed to be free from defects in material and workmanship for 1 year from the date of purchase. The MyoScan interconnect cable is guaranteed for 90 days.

During this time, in the unlikely event that repair is necessary, Thought Technology Ltd. will repair or replace your MyoTrac or MyoScan, free of charge.

This warranty does not apply to damage caused by static electricity, corrosion due to battery leaks or physical damage to the MyoTrac or the MyoScan sensor incurred through accident, alteration or misuse of the equipment.

### **For repairs or returns:**

Please call the Thought Technology technical support department for a Return Authorization (R.A.) number before sending any equipment to us.

Send the unit *postage prepaid and insured, with proof of purchase.*

Please provide a detailed description of the problem and write your phone number and address clearly. (See the form on the following page)

#### **In U.S.A.**

**Thought Technology Ltd.**  
Cimetra Industrial Park  
8396 Route 9  
West Chazy NY 12992

#### **Canada and all other countries**

**Thought Technology Ltd.**  
2180 Belgrave Ave.,  
Montreal, Quebec  
Canada H4A 2L8  
Tel: (514) 489-8251

## **Extended Warranty Program**

**An Extended Warranty program is available directly through Thought Technology Ltd. and its authorized service dealers/distributors. The program provides for an additional two years of warranty coverage, extending the one year warranty to *three* years.**

All Extended Warranty Terms and Conditions apply to the second and third year of ownership and take effect following the regular one year warranty period. The coverage includes:

### **Hardware, accessories and disposables**

- Replacement or repair of unit(s), sensor(s), cable(s) and extender cable(s).
- Replacement or repair of unit's carrying case and accessories (e.g. headphones, connectors, etc.)
- Maximum of five (5) days turnaround once equipment is received (excluding weekends and holidays).

### **Software**

- Updates, upgrades and maintenance releases of software products as these become available. Updates to user manuals and other software documentation may also be provided when applicable.
- Telephone support, available Monday to Friday from 9:00 AM to 5:00 PM, excluding Canadian Legal Holidays.

- A 24-hour facsimile service, an Internet E-mail address and a World Wide Web site are also available for technical support services.

### **Terms & Conditions**

- The price of the extended warranty program is as per the Extended Warranty Price Lists (MAR321US\$ and MAR322 CDN\$). Contact us for latest price list.
- Purchase of the extended warranty must be made within 30 days of the original purchase, and must be paid in full.
- To enroll, the customer is asked to send a copy of their original invoice. A new agreement will be signed with the customer listing the products covered under extended warranty, and the serial numbers of the units and/or sensors.
- TTL products will be maintained and supported, provided they are used only with the standard operating system and hardware provided by computer vendors, as specified in the TTL user manual.

Call us or see document: Extended Warranty Terms and Conditions (MAR105) for additional details.

## **Repair Return Form**

(Remove and include with the unit)

Name \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
Phone # \_\_\_\_\_  
Fax # \_\_\_\_\_  
E-Mail \_\_\_\_\_

Date Purchased \_\_\_\_\_

Retailer \_\_\_\_\_

Model # \_\_\_\_\_

Serial # MyoTrac \_\_\_\_\_

Serial # MyoScan \_\_\_\_\_

Return for credit (less than 30 days) YES \_\_\_\_\_ NO \_\_\_\_\_

Return for repair (clearly state problem)

---

---

---

---

**Please include a copy of original invoice & return to the  
address on the warranty page.**

## Other Products and Services from Thought Technology Ltd.

### ProComp<sup>∞</sup>™/BioGraph<sup>∞</sup>®

Versatile eight-channel computerized monitoring system. Able to monitor up to 8 channels simultaneously including EMG, EEG, skin conductance, temperature, heart rate, blood volume pulse, respiration and voltage inputs from other instruments.

Thought Technology's active sensors provide unmatched signal fidelity while our fiber optic cable provides complete safety and signal accuracy.

Ask one of our representatives for a demo diskette.

